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- (71) Applicant (for all designated States except US): **SENSOR HIGHWAY LIMITED** [GB/GB]; 8th Floor, South Quay Plaza, 183 Marsh Wall, London E14 9SH (GB).
- (72) Inventor; and  
(75) Inventor/Applicant (for US only): **HARTOG, Arthur, H.** [CA/GB]; 31 Butterfield Road, Southampton SO16 7EG (GB).
- (74) Agent: **KANAK, Wayne, I.**; Gamma House, Enterprise Road, Chilworth Science Park, Southampton SO16 7NS (GB).
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(54) Title: **INTERFEROMETRIC METHOD AND APPARATUS FOR MEASURING PHYSICAL PARAMETERS**

(57) **Abstract:** A method of measuring a selected physical parameter at a location within a region of interest comprises the steps of: launching optical pulses at a plurality of reselected interrogation wavelengths into an optical fiber (1) deployed along the region of interest, reflectors (2<sub>0</sub>, 2<sub>1</sub>, 2<sub>n</sub>) being arrayed along the optical fiber (1) to form an array (9) of sensor elements, the optical path length between the said reflectors (2) being dependent upon the selected parameter; detecting the returned optical interference signal for each of the reselected wavelengths; and determining from the optical interference signal the absolute optical path length (L) between two reflectors (2) at the said location, and from the optical path length (L) so determined the value of the selected parameter at the said location; wherein the step of determining the absolute optical path length (L) comprises carrying out a process in which the phase difference between the interference signals for a pair of the reselected wavelengths is estimated using an estimated value for the optical path length (L), the estimated phase difference is used to estimate the phase at each of those wavelengths, and the phase thus obtained is used to revise the estimated value for the optical path length (L), the process being repeated for some or all remaining wavelength pairs in sequence, on the basis of the optical path length (L) estimated for the immediately preceding pair in the sequence, thereby to progressively revise the optical path length (L) until it is known to a desired level of accuracy.

**WO 2004/070346 A2**